

NUEXCO

EXECUTIVE SUMMARY REPORT 208

(All data as of November 30, 1985)

Exchange Value
\$16.75, up \$0.25

The **Exchange Value** is **\$16.75** per pound U_3O_8 , up \$0.25 since last month.

UF₆ Value
\$46.00, unchanged

The **UF₆ Value** is **\$46.00** per kilogram U as UF₆, unchanged since last month.

Transactions

One recent natural uranium sale is reported, involving approximately 100 to 300 thousand pounds U_3O_8 equivalent. The sale involved spot or near-term delivery and also met the conditions for inclusion in the Transaction Value.

Supply-Demand Ratio
fell to 1.6:1

Active spot and near-term **uranium supply** amounts to **3.6 million** pounds U_3O_8 equivalent, up 405 thousand pounds since last month. Active spot and near-term **uranium demand** totals **2.3 million** pounds, up 1.4 million pounds. The spot and near-term **supply-demand ratio** fell to **1.6:1**.

Transaction Value
\$15.80, up \$0.05

The **Transaction Value** is **\$15.80** per pound U_3O_8 , up \$0.05 since last month. The calculation includes 14 transactions involving a total of 2.5 million pounds U_3O_8 and equivalent UF₆, and covers a period of 5 months.

Loan Use Charge Rate
unchanged at 5%

The **Loan Use Charge Rate** is **5 percent** per annum, unchanged.

Conversion Value
unchanged at \$1.60

The **Conversion Value** is **\$1.60** per pound U as UF₆, unchanged since last month in a dormant market. No active secondary market supply or demand for conversion services for delivery within three years is reported.

SWU Values
for 1986 delivery:
\$78 for DOE origin
\$78 for non-DOE origin

The **SWU Value** for DOE origin at .3 tails and certifiable as excess, is **\$78** per SWU for delivery by the end of FY86. The SWU Value for other SWUs (non-DOE or non-certifiable) is **\$78** per SWU for delivery by the end of calendar year 1986. One secondary market SWU transaction, involving less than 50 thousand DOE-origin SWUs, is reported.

* * *

Focus

Belgium recently completed the plant-construction phase of its nuclear power program as Doel Unit 4 and Tihange Unit 3 reached full-power operation in June and July of 1985. Currently, there are no plans for additional units in Belgium, but the nation's utilities and industrial groups are participating in various European nuclear energy projects.

Australia

The Olympic Dam partners soon will decide on whether to commit to the project despite the reported lack of firm delivery commitments.

Raw Materials

The worldwide search for uranium has resulted in the discovery and recognition of many unconventional types of uranium occurrence. Part One of a two-part article describes various classifications and sources of surficial uranium deposits, and examines some of the exploration techniques used to locate those deposits.

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NUEXCO REPORT 208 FIGURES OF THE MONTH (November 30, 1985)	This Month (Report 208)	Last Month (Report 207)	12 Months Ago (Report 196)
Exchange Value ¹	16.75	16.50	15.50
Transaction Value ¹	15.80	15.75	15.90
UF ₆ Value ²	46.00	46.00	—
Loan Use Charge Rate ³	5%	5%	6%
Conversion Value ⁴	1.60	1.60	0.80
Near-Term Uranium Supply ⁵	3.6	3.2	5.2
Near-Term Uranium Demand ⁶	2.3	0.9	1.3
Near-Term Supply-Demand Ratio	1.6	3.6	4.0
Recent Uranium Sales:			
Number of Transactions ⁷	1	5	3
Quantity of Material ⁸	0.2	1.4	9.8
Nuexco SWU Values: ⁹			
DOE origin, certifiable as excess, 0.3 tails assay, delivery before the end of FY86	78	83	—
Other SWUs (non-DOE or non-certifiable), delivery by the end of calendar year 1986	78	83	—
USDOE SWU Prices:			
USEC	125.00 ¹⁰	125.00 ¹⁰	135.00
AFC	153.00 ¹¹	153.00 ¹¹	153.00 ¹¹
Requirements	157.00 ¹¹	157.00 ¹¹	157.00 ¹¹
Market Value of Enriched UF ₆ (12 1/2):			
2.5 w/o U ₂ O ₈	451	460	518
3.0 w/o U ₂ O ₈	578	591	671
3.5 w/o U ₂ O ₈	707	723	828
4.0 w/o U ₂ O ₈	837	858	987

¹US \$ per pound U₃O₈ equivalent.

²US \$ per kilogram U as UF₆.

³Per annum.

⁴US \$ per pound U as UF₆.

⁵Active inquiries to sell, for delivery within 12 months after contract signing (millions of pounds U₃O₈).

⁶Active inquiries to purchase, for delivery within 12 months after contract signing (millions of pounds U₃O₈).

⁷Uranium sales only; does not include loans, conversion, or SWU transactions.

⁸Millions of pounds U₃O₈, equivalent.

⁹US \$ per SWU.

¹⁰Effective 10/1/85.

¹¹Effective 10/1/84.

¹²Calculated using the Nuexco Exchange Value, Conversion Value, and 0.30 percent tails assay. As of 4/30/85, calculations use the Nuexco SWU Value for DOE origin and delivery by the end of FY86.

¹³US \$ per KgU₃ as UF₆, rounded to the nearest \$.

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The following is a slightly edited version of a speech presented by George White, Jr. at the Atomic Industrial Forum's Annual Conference in San Francisco, California on November 11, 1985.

Introduction

Some very fundamental changes have occurred in the uranium market. I believe there is persuasive evidence to suggest that uranium prices are unlikely to rise to a level that will allow, in a free market environment, a rebirth of the US uranium production industry. More specifically, I do not expect to see uranium prices reach a level that will allow the US industry to produce more than 30 to 35 percent of US requirements. In addition, since it is almost certain that some portion of US production will always be exported, US utilities will likely obtain more than two-thirds of their long-term needs from non-US sources. In other words, the US uranium industry is unlikely to produce as much as 13 million pounds of U_3O_8 annually at any time in the foreseeable future.

It is inconceivable to me that, given current market data and unencumbered by a knowledge of the industry's history, a fresh observer of the uranium scene could postulate:

- a US industry that would produce 40 million pounds of U_3O_8 annually, or
- a US import embargo, or
- spot market prices of \$40 per pound U_3O_8 .

There are a number of factors which, in combination, lead me inexorably to the conclusion that these conditions will not occur. In no particular order of importance, they include:

1. A greatly expanded resource base characterized most recently by very high-grade and, presumably, low-cost finds.
2. A cumulative world inventory that has continued to grow, despite static or declining world production.
3. A competitive market for enrichment services that has negative implications for uranium demand.
4. Current and prospective technology developments that reduce uranium demand, including improved fuel design, increased recycling, and, perhaps most important, laser enrichment.
5. Finally, there is enhanced utility awareness and sophistication about the realities of capacity factors, supply, demand, and security of supply.

Each of these items suggests either decreased uranium demand, deferral of uranium demand, increased uranium supply, or lower-cost uranium supply. Taken together, they argue against higher prices and, by inference, against

a rebirth of a US production industry.

Resources

The expanded resource base is the result of the exploration boom that was triggered by the sharp price increases in the mid-to-late 1970s. Earlier concerns about the lack of sufficient uranium to fuel the multitudes of reactors on order have given way to recognition that this planet has more uranium than we are ever likely to need in our lifetimes, and price is the real issue. The province of Saskatchewan presents a multitude of deposits. Key Lake, Cluff Lake, Dawn Lake, and Cigar Lake are well-known names. Close Lake, with its indication of grades similar to those at Cigar Lake, is perhaps less well-known. Though not a geologist, I conclude that we have seen only the tip of the Saskatchewan uranium iceberg. Or, consider Australia, where the Jabiluka deposit, with more than 500 million pounds U_3O_8 proved, is effectively shut in by government policy. Or, consider ERA, which has announced plans to increase production from 6 million to 12 million pounds U_3O_8 annually. Or, consider the United States, which only five years ago produced more than 43 million pounds. There can be no doubt about the existence of adequate uranium resources. On the contrary, there is a surfeit. Furthermore, recent experience suggests there is every likelihood that further exploration efforts will lead to further high-grade finds.

Given the existing resource base, the propensity of miners to produce what they discover, the inclination of consumers to encourage such production, and given that uranium demand is essentially inelastic, there is a very powerful and natural impetus to put projects into production. At times, there are also political or economic driving forces.

In Australia, the huge Olympic Dam project is reportedly going forward in the face of difficult markets for its copper and uranium and a mediocre market for its gold. Production targets have been downsized from initial plans, but it will produce nonetheless. In Niger, where uranium provides nearly 75 percent of that country's foreign exchange, it can be anticipated that substantial cutbacks in uranium production would face strong opposition. Moreover, Canada has emerged as the world's largest producer based on its rich Saskatchewan deposits. There can be little doubt that Canada has the will and the means to protect and expand its market share.

Inventory

Nuexco estimates that cumulative world inventory will approach 500 million pounds U_3O_8 equivalent by year-

end 1985. This is sufficient to fuel all reactors through the end of 1990 if not a single additional pound were produced after today. Even during 1985, after five years of price decline, estimated production of about 95 million pounds U_3O_8 will exceed estimated consumption by some 5 to 10 million pounds. Of that 500 million pounds total inventory, more than 200 million is judged to be excess—in the sense that it is above desired inventory levels. As such, its inevitable impact on the market will occur in one of two ways. If held by a utility, and not sold, the inventory will delay the date when that utility needs new supplies. Alternatively, if the inventory is liquidated into the spot market, its sale will fulfill some end-user's needs, deferring that end-user's needs for new supply from primary sources.

While the uranium market has historically been inefficient with respect to the redistribution of excess inventory, the experience of the past two years suggests increased inventory mobility and enhanced market efficiency. The primary effect of rectifying the maldistribution of existing inventory is the deferral of need to purchase new supply from primary sources. Fewer buyers needing less material naturally results in intensified competition among sellers for those fewer, smaller, and deferred opportunities that do become available. Such competition leads to lower prices.

Enrichment

The uranium market is linked closely to that for enrichment services. In fact, from the early 1970s through 1983, the primary driving force underlying uranium demand was the requirement to deliver uranium to DOE to fulfill enrichment contract obligations. Not surprisingly, the uranium demand generated by these enrichment contracts was substantially in excess of and occurred earlier than real needs based on actual reactor consumption of uranium. Utilities were placed in the unusual position of purchasing uranium not to meet reactor needs, but to avoid the severely high financial penalties associated with failure to meet their enrichment obligations with DOE. This situation reached its zenith in the case of utilities taking and paying for uranium to deliver to DOE for enrichment even after their nuclear plants had been canceled.

Such a situation could not endure for long. The monopolistic US enrichment enterprise fostered competition in the form of a secondary market and two European enrichers, Urenco and Eurodif. As enrichment prices fell and the US dollar strengthened, DOE saw its market share and revenue stream erode. Finally, DOE adopted a market-driven and competitive business strategy, the

centerpiece of which was its new requirements-type contract. While this strategy has reestablished DOE as a viable player in the enrichment market, it raised havoc with the uranium industry. After 10 years of being driven by an artificial stimulus, uranium demand again became primarily a function of reactor consumption. Today, as the market readjusts itself based on real needs, uranium producers are feeling the full effect of the excesses engendered by DOE's earlier enrichment policy.

Furthermore, the relationship between uranium and enrichment prices is such that as SWU prices are driven lower in a competitive market, increases in uranium prices will tend to be restrained since utilities can use less uranium and more SWU.

Technology

Several developments in the area of technology point to reduced uranium requirements. Full reprocessing and recycle of uranium and plutonium could eventually reduce uranium requirements by as much as 30 percent. Today in the USA there are no reprocessing facilities in operation, nor are any likely to operate in the foreseeable future. However, reprocessing and recycle are proceeding in both Japan and Europe and will reduce the demand for natural feed in the years ahead. It should be noted, however, that such changes will be gradual and would be reflected not as visible reductions in demand, but rather as slower growth in demand.

In the area of fuel design, certain improvements, such as higher exposure, tend to decrease uranium needs. Other improvements, such as longer fuel cycles, can result in increased uranium needs. On balance, however, expected fuel improvements will likely lead to a net reduction in uranium consumption, perhaps as much as 5 percent, from the level forecast without such improvements.

A more important technology-related issue is that of the laser enrichment process. This process has been chosen by DOE as the next step in the US enrichment program. It holds the potential for dramatic reductions in enrichment prices. As one uses more SWU, less uranium is needed, and vice versa. Obviously, as the price of SWU declines, economics will dictate the use of more SWU and less uranium. Thus, cheap SWU represent a very real threat to uranium suppliers. Going a step further, it has been reported that the laser enrichment is economic using depleted uranium as feed. If so, I suggest that DOE's existing stockpile of tails represents one of the world's largest uranium mines. I further suggest that it is not out of the question to visualize that instead of selling only SWU, DOE could one day sell enriched product, using its

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inventory of tails as a source of uranium. This is speculative, but may not be that unrealistic, assuming AVLIS works as advertised. Furthermore, both the French and Japanese are also pursuing laser technology.

Customer Attitudes

Finally, there is the utility, the ultimate end-user. I suggest that, in recent years, the utilities have greatly increased their level of market sophistication. In the early 1970s, few utilities really understood the dynamics of the uranium market. However, antitrust suits, the Grand Jury investigation, the Westinghouse default, the roller-coaster price movements of all fuels, the increased attention of public utility commissions, and expanded sources of market information have all combined to lead to an increased awareness and market sophistication.

Early concerns about running out of uranium have faded with recognition of the real size of the resource base, and the knowledge that for the past 30 years, more uranium has been produced than consumed in each and every year. Similarly, uranium commerce is no longer the great mystery it once was. Uranium mining, conversion, enrichment, and fabrication are well understood, as are such associated factors as transportation, insurance, and specifications. Location, nationality and tails-assay swaps, uranium loans, deconversion, deenrichment, and even de-fabrication transactions are commonplace. And, after hundreds of reactor years of experience, utilities know that nuclear plants usually don't start as early as anticipated and recognize that capacity factors of 95 percent are not the norm.

As a consequence, utility views about the necessity of large inventories to protect against unanticipated events have moderated, as have their concerns about the likelihood or consequences of interruptions of supply. Inventory accumulation based on favorable spot prices will continue, but as prices rise, such accumulation will naturally decline. Inventory accumulation for security of

supply purposes will be less of a factor.

Price Implications

Consultants in every industry make price forecasts. The uranium industry is no exception, and a number of long-term forecasts have received media attention. These forecasts, stated in 1985 dollars, have been in the general range of \$30 to \$40 per pound U₃O₈. It is my personal view that such forecasts are too high. As noted, I believe fundamental, structural changes are in process in the uranium market, and that these changes will alter the market in the longer term. I conclude, therefore, that these forecasts may be as much as 20 to 30 percent too high.

I must emphasize that my comments assume a free market environment. If the base scenario is altered by a shutoff of uranium supply as a consequence of revolution in Southern Africa, or by cartel-mandated floor prices, or by a US embargo on foreign-origin uranium, the conclusions would have to be reexamined. However, for a number of political and economic reasons I do not believe that any of these events is likely. With respect to the issue of the viability of the US uranium industry, DOE has made official what most of us have known for some time—the US uranium production industry is not viable if viability is defined as the ability to economically produce and sell sufficient quantities of uranium to supply the major part of US utility needs. Notwithstanding the laws as written, the current court case, and calls for legislation to protect the US industry, I do not anticipate that the US government will take any meaningful action in that direction.

Nevertheless, a US uranium production industry will survive. The survivors will include in-situ and by-product producers and those conventional producers with higher-grade ore and rigorous cost control. In part, their survival will also reflect the desire of most US utilities to have at least some portion of their uranium supply be of US origin.